5:15

Star cult.

Acid-PB-SK BBP

BBP

BBP

PB-SK + SOM Control

(Without starters)

Protein biological value and raw-smoked sausage micpostructure as related to starter cultures MIKHAILOVA M.M., ANISIMOVA I.G., SOLODOVNIKOVA G.I., AVILOV V.V. and LAGODA I.V.\*, KOSAREVA G.V.\* The All-Union Meat Research Institute, Moscow, USSR \*The All-Union Dairy Research Institute, Moscow, USSR SOLODOVNIKOVA G.I., DYOMINA O.V., ALYOKHINA L.V., Researchers and manufacturers of the meat industry are concentrating on providing consu-mers with meat products of a high biological value. An extremely important problem is the rational utilization of raw materials for edible purposes, one of the ways of approaching the target bing the development of blotechnology. the target bing the development of biotechnology. Quality characteristics can be regulated by means of incorporating starters into meat pro-Biological value is an important quality characteristics of foods, equally with their chemical composition /7,8/. Research data on the biological value and microstructure of raw-smoked sausages and on the use of starter cultures are scarce in literature; therefo-re, it was of interest - both scientifically and practically - to study the effect of bacterial propagations on the rate of protein digestion and microstructure of raw-smoked bacterial preparations on the rate of protein digestion and microstructure of raw-smoked semi-dry sausage. As test objects served sausages produced with different starters, viz., Acid-SK, PB-SK, BBP, as well as PB-SK in combination with a milk protein (SOM). Control sausages were Bap, as well as PB-SK in combination with a milk protein (SOM). Control satisfies not prepared without starters. Satisfies quality was evaluated as follows moisture, fat, protein - according to the common methods, titratable acidity - titrometrically, protein algestibility <u>in vitro</u> - by means of Pokrovsky and Ertanov's method /9/, histological - according to common procedures/10/, organoleptical qualities - using a 5-point scale; lactobacilli were counted with the pla-te method, coliforms - with the MPR method. Sausages were produced using different mass-fractions of BEP and SOM. It is obvious from Table 1 that in minced meat samples with BBP moisture content is some-what higher than in the control one, and fat is lower. However, in the finished product this difference is leveled by the 20th day. The replacement level of 3 and 5% BBP and 2% SOM in sausages did not, practically, influence moisture, fat and protein in the fi-nished product. It should be noted that pH in this case was 0.4 unit lower, this reflecting a more intensive glycolytic process. Experimental results on the <u>in vitro</u> digestion rate of sausage proteins (Table 2) indicate that the use of starters contribute to higher pro-tein digestion as compared to controls.

42

Table 1

Table 2

1.62

1.72 1.68

1.56

3.40

2.20

1.92

## $\ensuremath{\mathsf{Physico-chemical}}$ characteristics of minced meat and finished products

Characteristics	* Minced meat with starters					' Finished products with starters								
	Cont rol	Acid SK	BBP, 3%	BBP 5%	BBP 7%	PB- SK	PB- SK+ 2%	Cont rol SOM	Acid	BBP	BBP	BBP	PB- SK	PB-SK +2% SON
pH Moisture,%	6.0 56.5 22.7	6.0 57.9 19.6	5.5 58.4 19.4	5.8 58.6 19.3	5.9 58.7 19.5	5.9 56.7 21.3	6.0 54.2 22.2	5.3 37.2 29.4 19.4	2.2 37.6 30.2 19.2	5.2 37.3 30.8 19.4	2.2 2.37.1 29.8 18.8	5.2 2 37. 29.9 18.7	5.0 4 37. 31.3 19.4	4.9 1 37.1 37.6 19.4

ter	of the ga	stro-en	teric tra	et el in hyd	rolyzates	, mg					
ure	level, %	Incubation time, hr									
		with	n pepsin		with trypsin						
		1 1	2	3	1 1	2	3				
SK	0 0 3	0.72 0.36 0.30	0.96 0.78 0.90	2.49 1.59 1.89	1.04 1.20 1.24	1.88 1.76 1.52	2.44 2.40 2.36				

0.92

1.08

0.87

1.79

2.16

1.50

0.94

1.08

0.64

0.39

0.42

0.42

0.48

3572

0

In-vitro protein digestion with the enzymes

The use of Acid-SK is more preferable than of PB-SK because of a faster rate of sausage protein with digetive enzymes, viz., by 42% with pepsin and by 37% with trypsin (on the dverage of controls). The pepsin hydrolysis rate of proteins of the sausages containing a starter culture as a meat replacer is nearly the sume as compared with controls. The trypsin hydrolysis of proteins in the sausages with BBP is more intensive and fast as compared to controls. The use of SOM to replace meat in combination with PB-SK improves pepsin and trypsin digestion of proteins. It was noted that the pepsin digestion. Alongside with protein biological value, we studied comparatively microstructural changes it the same sausges. Histological sections were stained with hematoxiline-eosine and Sudan-3 and examined under a light microscope (X 42). It was found that, microstructurally, semi-dry raw-smoked sausages with a starter added were similar as far as the dynamics of Structurization of surface layers during drying is concerned. However, by varying sausage formulations some structural specificity was demonstrated. E.G., sausages with Acid-SK and PB-SK had a similar structure which is compact enough and contains evenly distributed swollen fragments of muscle fibers and muscle bundles with fat inclusions in-between them, the microstructure of sausages with EBP (Fig.-1) added to replace an equivalent amount of neat (3-5%), is characterized with a sufficiently close arrangement of structural elements: Swollen fragments and muscle bundles are uniformly distributed, microbial colonies are more numerous and evenly located throughout the sample. 10% BBP addition to replace meat made the architectonics of the finished product unstable and loose (Fig.2) In case 2 or 3% SOM plus PE-S% addition replace meat, the structure is sufficiently stable, dense, uniform. At the 6% replacement level the microstructure is loose and unstable. Thus, the use of milk proteins (SOM) to replace 2-3% meat, in combination with a starte

produced without starters. Leat replacement with milk proteins in combination with starter cultures does not impair protein digestibility when compared to the sausages to which only starter cultures are added. It was demonstrated that sausage structure is related to a meat replacement level. The incorporation of 5% BBP with 3% SOM and PB-SK into sausage minced meat does not noticeably change the microstructure of the finished sausage.

## Table 3

Starter culture	Replacement	Scores by a 5-point scale								
	level, %	Colour	Aroma	Consistency	Taste	Acceptability				
Control Acid-SK BBP BBP BBP FB-SK PB-SK+SOM PB-SK+SOM PB-SK+SOM PB-SK+SOM	- 3570 234	4.05 4.1 4.1 4.2 4.0 4.0 4.0 4.0 4.0 4.0	3.9 4.1 4.1 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0	3.8 4.2 4.2 4.2 4.2 4.2 3.95 4.3 4.15 4.15 4.2 4.1	3.8 4.2 4.2 4.2 4.1 4.0 4.3 4.0 4.1 4.0	3.9 4.2 4.1 4.2 4.1 4.0 4.3 4.0 4.1 4.0				

## Organoleptical qualities of semi-dry raw-smoked sausages after 20-day drying





Fig. 1. Mictostructure of a semi-dry raw-samoked sausage with 5% BBP to replace meat, after 20-day drying: F - fat inclsions; MC - microbial colonies; MB - muscle fiber bundles.

Fig. 2. The loosened microstructure of a semi-dry raw-smoked sausage containing 10% BBP to replace meat, after 20-day drying: V - vacuoles; F - fat inclusions; MC - microbial colonies.

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